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REEXAMINING THE RELATION BETWEEN DEBT MIX AND GROWTH IN JAPAN

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Comments welcome

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Reexamining the Relation between Debt Mix and Growth in Japan

Abstract. We propose a U-shaped relation between the relative weight of bank loans in total corporate debt and the firm's market-to-book ratio—a proxy for expected growth—which reconciles most existing theories. Using data on Japanese firms for 1983-97, we do find that, in the lower range of growth spectrum, firms with better prospects take more bonds in their debt mix: when the firm's prospects improve, the benefits from private debt initially fall relative to its costs. In contrast, in the higher range of growth, firms with more growth potentials take more monitored debt, reflecting, amongst other factors, the higher information and contracting costs of public debt faced by extreme growers. We can explain the seemingly conflicting evidence that Anderson and Makhija (1999) and Hoshi, Kashyap and Scharfstein (1993) provide in this respect. We also find that keiretsu firms do not behave significantly different from non-keiretsu ones, suggesting that keiretsu firms are fairly independent in their financing decisions and that extra costs and benefits from bank loans are either small or in reasonable balance. Firms that faced restrictions in issuing bonds, pre-1990, continue to behave differently from other firms long after the restrictions were lifted.

Key words: Bank Loan, Monitoring, Outside Debt, Debt Choice, Growth.

JEL Classification Code: G32, G21

Reexamining the Relationship between Debt Mix and Growth in Japan

1. Introduction

A non-trivial aspect of a corporation's capital-structure policy is the choice between monitored debt—primarily bank loans—and arm's-length debt (most bonds). On the basis of considerations of information asymmetries and conflicts of interest, Diamond (1991) proposes a negative relation between the relative use of bank debt and the borrower's quality and prospects (usually measured by the market-to-book ratio, a proxy for the market's degree of confidence in the firm). Empirical work for Japan (and elsewhere), however, has produced mixed results. Hoshi, Kashyap and Scharfstein (1993), using 1992 Japanese debt-structure data, do find the predicted negative association among keiretsu-affiliated firms. In contrast, when Anderson and Makhija (1999) study similar data from the early 1990s, they observe a positive relationship, in particular for firms that face restrictions on public bond issuing. The purpose of this paper is dual. At the theory level, we argue that there are plausible grounds indeed for a positive association, but mainly towards the high end of the market-to-book spectrum. That is, we conjecture that there may be a U-shaped relation. At the emprirical level, we convincingly document the existence of such a relation and we track the source of the contradictions in the above empirical work on Japan.

We find that, most of the time, most of the firms turn out to be on the negatively-sloped part (as the Diamond argument predicts). Only around the time of peaking stock prices is there a brief interlude where almost half of the firms are on the positive-sloping section. But as the right tail of the distribution of book-to-market is much more spread out, this half of the 1990-92 sample dominates the sample if one runs a purely linear regression. In short, while for some of the firms and some of the time there is, empirically, a predominantly positive link, this early-90s phenomenon is not really representative. In fact, we find that once one adds market-to-book squared, the U-shape is quite manifest in all subperiods. We also find that the firms in the positively sloped domain of the U-shape are *not* those that, until 1990, faced regulatory restrictions in tapping the public-bond market, the subgroup emphasized by Anderson and Makhija (1999). For those firms, the relation between the loan ratio and growth is rather unclear; and, interestingly, they continue to behave differently from others long after the restriction is lifted. By contrast, we find no evidence whatsoever that keiretsu firms did behave differently from non-keiretsu firms as far as the loan-ratio/market-to-book relationship is concerned. This finding suggests that keiretsu members were still fairly independent in their financing decisions and that their main banks' rent-extraction behavior (if any) was reasonably commensurate with the benefits (if any) that banks provide.

In Section 2, we review the arguments for a positive or negative relationship between the bank loan ratio and market-to-book. Section 3 motivates the test design and the choice of Japan as the testing ground. A description and qualitative discussion of the data follows in Section 4, and the regression output in Section 5. Section 6 concludes.

2. The choice of private v. public debt and corporate growth: the hypotheses

We first review the hypotheses in the extant literature that support either a positive or a negative relation between the debt mix choice and growth (subsection 2.1). Then, we propose a non-linear hypothesis that reconciles the existing theories (subsection 2.2).

2.1. General pros and cons of private debt (bank debt)

To a large extent, the issue whether to use monitored bank loans or arm's-length bonds arises from a combination of conflicts of interests (stockholders *v.* bondholders) and information asymmetries (firm *v.* market). These asymmetries lead to agency costs, such as asset substitution or under-investment (Jensen and Meckling, 1976; Myers, 1977). The asymmetries also mean that financing in the market entails high information costs (Myers and Majluf, 1984). The advantage, in this respect, of using monitored or bank debt has been well understood in the literature: bank loans help mitigate a firm's agency problems because banks can monitor and control the client firms, while individual bondholders have no incentive to monitor due to a free-riding problem.[1] In addition, a bank is often better informed than other potential lenders in the first place, because firms are often prepared to reveal, during private negotiations, proprietary information that they would balk at divulging to the general public (Campbell, 1979, and Yosha, 1995). Lastly, if the borrower's luck turns, bank loans are renegotiable. In contrast, public debt all too often imposes inflexible constraints, leaving inefficient liquidation as the only exit (see also Detragiache, 1994, and Chemmanur and Fulghieri, 1994).

The efficiency gains that result from adopting bank debt rather than bonds can be shared between lender and borrower. But also uninformed third parties may benefit. The market, many argue, realizes that a history of bank/firm interaction and monitoring provides banks with an information advantage over other lenders (Fama, 1985): the house bank tends to be "inside" while arm's-length lenders typically remain "outside". A bank's seal of approval therefore signals information (Leland and Pyle, 1977; Campbell and Kracaw, 1980). Consistent with this view, empirical studies find that the market views banks' lending

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[1]Bank loans are concentrated in a few lenders while bonds, being public debt, are generally diffusely held. Although bond covenants can mitigate agency problems associated with financing with bonds (see Smith and Warner, 1979), this difference still gives rise to higher agency costs of public debt relative to close-held monitored debt (see, e.g. Diamond, 1984; Berlin and Loeys, 1988, among others).

decisions in a positive light. For example, James (1987) and Lummer and McConnell (1989) find that stock price responses to the announcements of bank-loan agreements and renewals are significantly positive. Such signaling, in turn, can lower the information and contracting costs in that it relieves other fund providers from similar costly evaluations (Easterbrook, 1984; Fama, 1985).

Other authors are less optimistic about such externality effects. To a lender, the information from a bank's willingness to fund is unambiguously positive only if the bank debt is junior to the other lender's. If that is not the case, the bank's decision to lend still leaves many uncertainties, and its private information is not easily inferred by third parties. Nor are banks motivated to divulge such information: to the contrary, as it takes time and effort to switch banks and rebuild a new relationship, firms are, to some extent, hostages to their existing bank relation. Thus, by virtue of their information monopoly and the relation-specific assets, Sharpe (1990) argues, banks may use their information-monopoly power over client firms to "hold up" firms and extract rent, ex post. Rajan (1992) further suggests that, given this holdup behavior of banks, firms may, ex ante, reduce their incentives to exert effort if they expect to receive too small a share of the future rent. To test this conjecture, one can use the logic that hold-up behavior, if any, should be most prevalent when there is no ex post competition (von Thadden, 1992)—for example when firms do not have multiple bank relations.[2] Houston and James (1996) empirically investigate the effect of the presence/absence of multiple banking relations and find evidence consistent with Rajan's hypothesis. Specifically, a U.S. firm that maintains borrowing relations with just one single bank typically takes on *less* bank loans in their debt mix, the better its market-to-book value ratio. This is in marked contrast to firms that deal with many banks: these even take on *more* bank loans when they have relatively higher market values. Thus, it does look as if, unchecked, banks may impose important costs onto their customers.

2.2. The Case for a U-shaped Relation between loan and growth

The existence of hold-up costs can explain why, in any given cross-section, some firms do prefer public debt to bank debt, notably when the benefits of monitoring are below the hold-up costs.[3] As argued by Diamond (1991), also for any given firm the demand for monitored

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[2]This is, however, not an all-or-nothing situation. Sharpe (1990) argues that even with ex post competition hold-up behavior can occur—again, this is related to whether or not information collected during the relation can be easily transferred to other lenders. On the other hand, there can be mitigating factors other than competition, such as loan commitments provided by inside banks and backed by their reputational capital (Boot, Greenbaum and Thakor, 1993).

[3]Even the very existence of benefits from relationship banking is sometimes questioned. Carey, Post and Sharpe (1998) investigate the determinants of the private debt mix (bank debt versus other private debt) and find that banks do not differ from other private lenders in providing finance to companies with large information problems. For example, banks tend to abstain from financing firms that are observationally riskier, probably for reasons of bank liability and reputation. Kroszner and Strahan (2001) find that banks do not have a seat on the

debt is changing over time with the firm's reputation in the market and, to some extent, the degree of asymmetric information it faces. In fact, the very use of costly monitoring through bank loans[4] eventually works against the use of bank loans. Specifically, by keeping borrowers from undertaking injudicious investments and by certifying their confidence in these firms, banks improve their customers' growth prospects and reputation in the market and therefore, unintentionally, enable them to gradually switch towards cheaper unmonitored, public debt.

This line of reasoning predicts that, the higher and the more reliable the firm's growth prospects, the less it will resort to bank loans. Accordingly, the empirical literature typically tries to relate the loans-to-debt ratio (that is, bank debt over the sum of bank debt and bonds) to the firm's market-to-book (MtB) value ratio. This ratio, also called the value-to-cost ratio, is typically interpreted as measuring the relative importance of the firm's growth-related intangible assets (see, for instance, Smith and Watts, 1992)—an amalgam of management's ability to add value, the earnings potential or quality of assets in place, the firm's likely future investment opportunities, and reliability (low risk). In the literature, the variable is firmly called "growth", even though it also contains normalized return on investment (assets) and the risk premium.[5] As we have some indications that the other factors may have to some extent obscured the relation, we prefer to call it just the market-to-book ratio or MtB.

For U.S. firms, it turns out, the relation between debt mix and MtB is inconclusive (see, for instance, Johnson, 1997). So is the extant Japanese evidence. For instance, Anderson and Makhija (1999) find that higher-MtB firms borrowed *more* from banks, both before and right after the 1990 generalization of access to bond markets; they infer that Japanese bank loans provide monitoring benefits without imposing meaningful holdup costs. But from a similar study, Hoshi, Kashyap and Scharfstein (1993) conclude that for keiretsu firms the relationship is negative, suggesting that for these firms there are significant holdup costs.

Diamond's (1991) negative relation between the use of monitored debt and firms' market-to-book ratio is to a large extent associated with better growth prospects and/or lower risks as financing becomes easier: the young (or restructuring) firm gets promoted to a higher market-to-book class as it is able to reduce skepticism among investors and (re)build reputation. But this particular life cycle may not apply in all cases. Some young firms may start off with unusually good growth prospects (relative to risk) and, therefore, high initial value-to-cost ratios. In such a sample, the life cycle is primarily one of growth that falls relative to the cost of capital as the firm gradually exercises its investment options. There are

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boards of firms that could become financially distressed, which they interpret as a result of the bank liability regulation.

[4]Following Rajan (1992), we enlarge the notion of "monitoring cost" so as to cover also rent extraction.

[5]The Gordon-Shapiro model predicts that $MtB = E_t(ROI_{t+1})/(R_f+RP-g)$, where ROI denotes cash flow over book value of assets, R_f the risk-free rate, RP the risk premium, and g the (perpetual) growth rate of cash flows.

many arguments in the literature suggesting that, towards the highest end of the market-to-book spectrum, the relation between bank debt and growth may turn positive: (*i*) Firms with high market-to-book ratios also tend to face large uncertainties as adverse macroeconomic or sector-specific shocks can drastically reduce the value of the hoped-for investment opportunities. These large uncertainties mean high credit risks and high information costs when raising public debt, problems that are better solved via "inside" bank relations.[6] (*ii*) As argued in the introduction, public debt is inflexible, which makes it costly and inefficient in the event of financial distress—a threat that is of special relevance to high-growth firms (Berlin and Mester, 1991). (*iii*) High growth tends to be associated with proprietary information which firms are loth to share with the general public but can divulge in private (Yosha, 1995). (*iv*) As Chan, Siegel and Thakor (1990) argue, bank loans are preferred over public debt when the firm has management skills but no credit reputation, a description that is again rather likely to fit a young, high-growth firm. (*v*) Bank loans are largely short-term debt while bonds are mostly long-term debt; and, as Barclay and Smith (1996) point out, empirically firms with more investment opportunities use significantly more short-term debt than long term debt.

On balance, then, we posit a U-shaped relation between the debt source choice and the value and cost ratio. Figure 1 illustrates this. At the lower end of market-to-book ratio spectrum, firms are of low quality with poor growth prospects, while at the high-market-to-book end we find high-growth firms with severe information asymmetries and no credit reputations, who value the flexibility and comparative confidentiality associated with bank loans. Both groups mainly rely on bank borrowing, but for different reasons. The low-growth firms need monitored debt for the purpose of reducing agency problems (such as verifying the quality of the investments) and (re)building a reputation, while the latter can better communicate with inside banks and count on them for information processing and dissemination. Toward the middle of market-to-book ratio spectrum, in contrast, firms have good (and reassuringly unexceptional) growth prospects and "normal" risks, which makes them less vulnerable to information or credibility gaps and, therefore, more likely to rely on public debt.[7]

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[6]True, this does not necessarily mean high-growth firms are entirely shut out from the public-debt markets. Stein (1992), for instance, suggests that convertible bonds provide a way for high-growth firms to mitigate an information gap. Still, such asymmetries remain a serious obstacle to straight-bond borrowing.

[7]Hoshi, Kashyap and Schafstein (1993) also suggests a non-linear relation between the debt mix choice and firm's growth but with an inverted U-shaped curve; they predict that firms at the two extremes of value-to-cost ratios take more public debt and in the middle more bank loans. However, they could not find supporting evidence.

3. Test Design

In this section we motivate our main testing procedure. First we briefly describe the data (subsection 3.1), and then discuss four reasons why the Japanese experience should be particularly interesting for our purpose (subsection 3.2). We also introduce the control variables (subsection 3.3). Lastly, we discuss regression specifications (subsection 3.4).

3.1. The Data

We retrieve our Japanese data from the Pacific-Basin Capital Markets (PACAP) databases. The annual data on balance sheets and income statements cover two decades, 1977-97. We select all listed firms excluding the financial, utilities, and (heavily regulated) transportation and communication sectors. To qualify for inclusion, the firm should have 20 years of non-missing data[8] on (i) book value of short-term bank loans (data items JAF33, 34), long-term bank loans (JAF48) and bonds outstanding (JAF49, 50, 51); (ii) book equity (BAL21), and (iii) market equity (MKT3 ¥ MKT5—stock price times shares outstanding at fiscal end) toward 1997. Full-data requirements like this usually create a severe survival bias; but in the population of Japan's listed firms in our sample period, corporate demises are too rare to have a material impact. The advantages of a full-data sample is that it allows us to track more accurately the evolution of the choice of funding sources of corporate debt finance in Japan during the period of deregulation (1980s) and post-deregulation (1990s), and to use regression analysis that pools various cross-sections over time. The drawback is that young firms that get listed during the sample years are excluded. This reduces our chances of statistically establishing the existence of a positively sloped part: empirically, these new entrants tend to have above-average MtBs as well as above-average loan ratios (results available on request).

The financial data are defined as follows. Loan covers both short- and long-term loans (JAF33, 34, 48); note that short-term bank loans (JAF33, 34) include the short-term portion of long-term loan. Debt is the sum of loans, straight bonds (JAF35, 49, 50) and convertible bonds (JAF51).[9] We omit liability items on trade accounts, which firms usually try to balance with comparable assets items, and we consider only interest-rate bearing debt in our debt mix. Leverage is Debt divided by the book value of total Asset.

To make sense of our time labels, below, note that in the regressions we relate year-end loan ratios to lagged market-to-book ratios; years are fiscal years (usually ending in March

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[8]Zero values are admissible, and do occur.

[9]We simply define loans as bank loans or monitored debt and bonds as public debt. The PACAP database that we use does not allow us to single out non-bank loans and bonds guaranteed by banks (see a detailed discussion on this issue by Anderson and Makhija, 1999). This inevitably makes our loans-to-debt ratio imprecise as a measure for the proportion of monitored debt in the total debt. There is no clear reason why our noisy proxy would be biased in favor of the non-linear specification set forth in Figure 1 and instead it tends to bias our tests toward insignificance and makes our tests more conservative.

31); and the time label we apply to an observation refers to the fiscal year the loan ratio is observed. Thus, the 1990 observation contains the March 1990 loan ratio but the lagged market-to-book ratio in 1989—the peak value as the last annual fiscal year observation before the stock-price collapse, end 1989 and early 1990.

To test whether MtB acts as a proxy just for growth—that is, whether risk and normalized current profitability are useful corrections or not (see footnote 5)—we also experiment with average realized sales growth over the past five years. Sales are data item INC1 in the PACAP database. We also test for the role of the pre-1990 regulation that partially or wholly constrained some firms' access to the public bond market. A constrained firm is defined as a firm that does not meet the (time-independent) bond issuance criteria listed in Table 2 of Anderson and Makhija (1999).

In the subsections that follow, we raise the question to what extent, and in what directions, the general U-function should change over time or differ across subsets of firms with different corporate-governance characteristics; we list and discuss the control variables; and lastly we provide some details about the estimation specifications.

3.2. Heterogeneities over time and across subsets of firms

The sample we study exhibits many heterogeneities that may sometimes confound the additional hypotheses that we (and others) may wish to formulate, especially as to how the functional relation between the loan ratio and growth changes over time or across classes of firms. First and foremost, there is the 1990 stock market crash and the slump that followed, which is likely to have shifted the relation between borrowing choices and growth prospects. We also discuss other ways to subdivide the data. In this literature, specifically, keiretsu firms have been studied separately by Hoshi, Kashyap and Scharfstein (1993), while Anderson and Makhija (1999) focused on firms that had only restricted access to the public-bond market.

- *The stock-market crash and the ensuing slump*

Over time, the cross-section of market-to-book ratios has swollen and shrunk dramatically, in line with Japan's stock-market boom and bust. Table 1 provides some information on the distribution of the (lagged) market-to-book ratios. While the mean value of the lowest-glamour decile stays relatively stable, there is a marked variation in the upper-decile mean. In the "1990" data (i.e. the 1989 market-to-book data), the highest decile is 6.53, compared with an average of 4.29 in the bull years 1983-89, and 2.92 during the 1991-97 slump. As a result, the interdecile range, starting off at an average of 3.15 (viz. 4.29 - 1.14) in the roaring 80s, widens to 5.00 in sample-year 1990 and then shrivels by almost two thirds, to 1.87. The median's path is analogous—from an average of 1.8 before 1990, it balloons to 2.67 in 1990, and then wanes to around 1.55 afterwards. Thus, a hypothetical firm with a steady book-to-market ratio of 1.50 would be classified around the 33-th percentile in the first period, demoted into a

fifth-percentile pariah in the 1990 sample, and upgraded back to the median class afterwards. How should the relationship between loan-ratio and MtB shift in light of the changing circumstances?

When MtB ratios shrink, we do not expect the parameters of the U-shape to remain constant, that is, with firms simply migrating from the positive-sloped section of the U-shape toward the negatively sloped one. Rather, we actually expect the U-shape to narrow-down even faster than the range of MtB ratios, so that more firms end up on the positive end. One reason is that the advantages of bank financing cited in the literature should have become more prominent in the 90s: an adverse macro-environment, higher default risks and generally larger uncertainty all exacerbate the problems of adverse selection and moral hazard. As a result, most of the firms that already went for heavy bank-financing prior to the slump should have even more reason to chose loans over public debt, despite their lower MtB ratios. Also erstwhile bond issuers should have become sensitive to the merits of bank financing, especially since, for less than top-notch firms, also the "cheap" financing via equity-linked bonds dried up as investors fled for quality.

- *Keiretsu versus non-keiretsu firms*

It is well known that Japan's corporate-finance and governance structures have been rather different from the U.S. (see Hodder and Tschoegl, 1985, 1993; Mayer, 1988). In particular, Japanese banks played a much more active role in client firms' corporate governance and finance.[10] As a result, Japanese firms were, on average, relatively highly levered with their debt traditionally consisting mostly of bank loans.

Not surprisingly, leverage has been particularly high for "horizontal" (*i.e.* "Big-Six") keiretsu firms. These groups of firms have long been admired as the prime exponents of Japan's main-bank-centered corporate governance and finance. With reciprocal equity holdings between main banks and firms as well as among member firms, Berglof and Perotti (1994) argue, the keiretsu governance and finance structure is able to mitigate problems of both incentive conflicts (Jensen and Meckling, 1976) and information asymmetries (Myers and Majluf, 1984). Early studies by Hoshi, Kashyap and Scharfstein (1990a,b, 1991) find that, thanks to their keiretsu ties, keiretsu firms had been less constrained by their internal cash positions, allowing them to continue their investments and growth even when short of cash. But later evidence suggests that this cash may not always have been used wisely. Wu, Sercu, and Chen (2000) find no evidence that, in 1974-95, keiretsu firms did enjoy any cost of capital

[10]See Aoki, Patrick, and Sheard (1994) for a review on the Japanese main-bank system, and Gerlach (1992), for the Japanese industrial groups. In a keiretsu there are long-term implicit contractual relationships among several banks, one of which serves as main bank. Aoki, Patrick, and Sheard (1994) point out that virtually all Japanese firms, keiretsu or not, have a house bank. This is no surprise: relationship banking exists everywhere in the world. However, they argue that Japanese main-bank system is special in that it is more corporate-governance oriented and goes way beyond relationship banking in the usual sense.

advantage. Worse, the largest among the keiretsu firms added significantly less firm value than their non-keiretsu counterparts within the same industry (see also Weinstein and Yafeh, 1998). Wu, Sercu and Chen conclude that the larger keiretsu firms have over-invested. This is consistent with the prediction by Dewatripont and Maskin (1995) that (less arm's-length) centralized credit markets like Japan's suffer from the "soft-budget-constraint" problem of persisting with unprofitable projects.[11]

It is difficult to predict in what direction keiretsu firms should differ from non-keiretsu ones regarding the relation between borrowing choices and growth prospects. In terms of potential for rent extraction, keiretsu banks would figure rather prominently in any line-up of suspects: if, as empirical work suggests, such behavior already occurs in the U.S. (Houston and James, 1996), then it could become even more likely when, as within a keiretsu, the house bank is a powerful shareholder in itself or acts as a part of a powerful group. Ceteris paribus, this predicts that firms should turn away from bank financing sooner, and return to it later, if and when their growth prospects improve. On the other hand, we also know that the benefits from relationship banking (to either lower-reputation firms or fast-growing ones) could become much larger if bank and borrower are very much related to each other. As these forces work in opposite directions, it is not a priori obvious whether one should see a more pronounced U-shape for keiretsu member firms, or a flatter one.

It is actually arguable that, in the keiretsu sample, the interest is in the presence of a U-shape at all, rather than in how that U-shape compares to the one for other firms. One can indeed doubt whether, for keiretsu firms, the arguments for the U-shape cut any ice in the first place. The reason is that these arguments assume an independent firm that acts its own best interest; in a keiretsu group, however, many decisions are taken centrally and in the interest of the group or its ultimate stakeholders. Stated differently, the very presence of a U-shape even for keiretsu firms would provide evidence that keiretsu firms did retain a sufficient degree of independence in their financing decisions and that, as a result, banks have been constrained in their rent-extraction behavior.

- *Japan's Deregulation*

As mentioned, during the sample period Japan has gradually deregulated its financial markets. This process started in mid-70s, speeded up in mid-80s, and culminated in 1990 when most of

[11]Shleifer and Vishny (1997) recognize that corporations in successful market economics such as in the U.S., Germany and Japan have somewhat different ownership structures and hence corporate governance systems but available evidence cannot resoundingly tell which one of their governance systems is the best. However, recent studies on Japanese ownership structure have started to unveil a dark side of Japanese governance system. For instance, Morck and Nakamura (1999) argue that Japanese governance practices did not assign effective control rights to residual claimants due to too much governance power in the hands of banks rather than shareholders. Consistent with this view, Morck, Nakamura and Shivdasani (2000) find that there is a negative relationship between bank ownership and firm value when bank ownership is large enough to affect corporate governance but not large enough to align bank interests with those of shareholders.

the original tough restrictions on bond issuance were lifted. For example, before 1983, only Toyota and Mitsushibi were allowed to issue unsecured corporate bonds in Japan and main banks usually guaranteed secured bonds. One implication is that industrial bonds issued prior to 1983 are economically equivalent to main-bank loans financed by bank-issued bonds; that is, pre-1983 bank-loan ratios are not what they may look at first sight.

For keiretsu groups, another important change is worth mentioning: in the late 70s, banks were informed that, as of 1987, their stock holdings in any individual firm should not exceed five percent of that firm's shares outstanding. This, of course, reduced banks' ability to directly control related firms. The weakening powers of the main banks would suggest that if the U-shape is missing (or at least less pronounced) in the earlier period, then it may still emerge in the second period, when member firms start behaving more independently. However, the keiretsu firms could look for alternative ways of maintaining control. First, the erstwhile bank-held shares were placed within the group's non-financial corporations, thus becoming industrial cross-holdings. Second, the bank's degree of direct control was, to some extent, re-established by shortening the time to maturity of bank loans, i.e. by stepping up the frequency of borrower performance reviews, as we will see. Thus, it is again not *a priori* obvious whether so much has changed (during the sample period, at least).

It has been conjectured that, if the benefits from bank loans are more than wiped out by hold-up behavior, then the lifting of barriers to entry should prompt firms to migrate towards the bond market (Hoshi, Kashyap and Scharfstein 1993). On the other hand, if benefits from bank financing outweigh costs, deregulation should produce little or no such shift (Anderson and Makhija 1999). We are not fully convinced of the validity of these hypotheses. First, one would expect such migration even if banks neither help nor hold-up their customers: when there is no genuine difference between loans and bonds, firms would still not mind using at least some bonds when the access to public debt is opened up to them. Thus, in itself the observation that bank loans are to some extent replaced by public debt is not conclusive. The same problem would have arisen if no migration towards bond markets had been observed. Indeed, suppose that banks do appropriate all, or almost all, of the benefits from closer lender-borrower relationships. Then their likely reaction to deregulation is to moderate their hold-up behavior such that bank financing remains marginally more attractive than the new alternative, the bond market. Thus, one might see little or no shift in the debt mix even if there is hold-up behavior both before and after the lifting of controls. There is another reason why the absence of such a shift does not necessarily provide evidence against hold-up behavior: the abolishing of previous tough bond issuance regulations in 1990 coincided with the slump and the beginning of the recession. As we have shown, the slump should increase the attractions of bank financing. Thus, if after the liberalization one sees *no* migration of erstwhile constrained firms towards public financing, this could reflect the slump rather than the absence of hold-up behavior.

3.3. Control Variables

Corporate choice of debt type is related not only to growth prospects and information problems, corporate-governance structure, and regulatory or macroeconomic shifts, but also to a host of other firms' characteristics. To better isolate a growth effect, we include control variables other than value-to-cost in our cross-sectional analysis. All our control variables have been used in Hoshi, Kashyap and Scharfstein (1993), Houston and James (1996), Johnson (1997), or Anderson and Makhija (1999):

- *Size*. The log firm value is a popular proxy for information, contracting and monitoring costs as well as credit risk. Fama (1985) argues that smaller firms are subject to more information asymmetry and have lower contracting costs for inside loans such as bank loans than for outside debt.[12] Thus, smaller firms prefer bank loans. Also, Nakamura (1993) points out that the large firms maintain accounts with many banks, so that information production by banks is less effective. In contrast, smaller firms can enjoy monitoring benefits from inside banks' exclusive information on their transaction accounts. Diamond (1991) provides another explanation for the preference of larger firms to unmonitored debt: larger firms are on the negatively-sloped section of the demand for monitoring because they have gained better reputations in the market. Also economies of scale in the issuance of public debt favor large firms (Blackwell and Kidwell, 1988). In general, firm size carries a weight in credit-rating evaluation, with smaller firms being in a weaker position and, therefore, more likely to stay out of the public-debt market.

- *Leverage*. The debt over total-assets ratio is a proxy for the likelihood of financial distress and risk of inefficient liquidation. Firms with a higher leverage are more easily financially distressed. From Chemmanur and Fulghieri (1994), these firms prefer bank debt to public debt because public debt is likely to lead to inefficient liquidation when the firm actually fails to meet its obligations.

- *Fixed-asset ratio*. Fixed assets over total assets acts as a proxy for collateral value and liquidation value. Hoshi, Kashyap and Scharfstein (1993) argue that firms with higher fixed asset ratio have lower information costs of issuing public debt and hence prefer bonds to costly bank loans.

- *Coverage and earnings volatility*. The coverage ratio, that is, operating income over interest payment, proxies for financial health. Coverage enters our regressions as an indicator (which is one if coverage falls below three, and zero otherwise), which should be positively related to risk. The fifth regressor is volatility of earnings over the last five years, a proxy for both credit risk and precision of interim indicators. Demsetz and Lehn (1985) argue that, for

[12]This view is further elaborated in the relationship banking literature that suggests small firms with close banking ties have a better position to get access to cheaper credit (see Berger and Udell, 1995, and Peterson and Rajan, 1994).

outsiders, firms operating in uncertain environments are more difficult to value. Similarly, Berlin and Loeys (1988) suggest that firms with less accurate financial indicators prefer bank loans. Thus, we hypothesize that the bank-loan ratio is positively related to both volatility and the "cov<3" indicator.

- *Pre-1990 constrained access to the bond market.* The constrained firms are those that do not meet the bond assurance criteria listed in Table 2 of Anderson and Makhija (1999), which were abolished in 1990. The dummy variable CON takes on the value of unity if a firm is constrained and zero otherwise.
- *Year and industry factors.* All samples containing more than one annual cross-section contain dummies for the year. We also added a set of industry dummies to allow for sector effects.
- *Keiretsu membership.* The Big-Six horizontal keiretsu are Mitsui, Mitsubishi, Sumitomo, Fuyo, Sanwa, and Dai-ichi Kangyo groups. The keiretsu firms in our sample either meet the classification by Nakatani (1984), or are the closely-affiliated members (with the degree of the 2-, 3-, and 4-star inclination) to the Six Groups as classified in the 1992/93 edition of *Industrial Groupings in Japan – the Anatomy of the "Keiretsu"*. By implication, then, our non-keiretsu firms are either the unaffiliated firms or the weakly related members (a 1-star affinity to the Six Groups).

3.4. Regression specification and econometric issues

The control variables enter in the standard linear way. For MtB (the market-to-book ratio), however, we also introduce MtB squared, MtB^2, to be able to capture the hypothesized U-shape. For firms with constrained access to the bond market prior to 1990, we have additional regressors CON, CON*MtB, and CON*MtB^2. In the remainder of the paper we refer to this regression specification as Model I.

As we have pointed out earlier, keiretsu membership is likely to make a substantial difference (see also Nakatani, 1984). We incorporate this into the estimations by introducing a "Model II" variant, which includes a differential intercept and interactions between a keiretsu-membership dummy (K=1 for keiretsu firms) and the main variables of interest, MtB and MtB^2.

There are three econometric issues. First, one might argue that keiretsu membership is an endogenous variable. While economic logic does suggest that keiretsu membership should be an optimal response to the firm's and the industry's characteristics, we very much doubt whether this still is the case in our data. Keiretsu affiliation turns out to be very stable over time, despite the huge institutional and macro-economic upheavals over the two decades we study. For many firms, membership even harks back to the pre-war zaibatsu groups. Thus, while (non-)affiliation probably was an optimal response to the capital-market situation that

prevailed at the time these groups were set up, right now a firm's membership is mostly a matter of historic circumstances exogenous to current data (see also Morck, Nakamura and Shivdasani, 2000).

A second econometric issue is that the left-hand-side variable—bank loans as a fraction of total debt—is constrained between 0 and 1, implying that the residuals cannot be symmetrically distributed around the fitted value for all values of the regressor. Especially the upper bound, unity, is often binding. To cope with such lopsided residuals we follow the extant literature and adopt Tobit regressions.

A third econometric issue is correlation across firms and over time. When pooling cross-sections from different years, we allow for a common random time effect across all firms, by including year dummies. We also include industry dummies. In addition, we skip two years after each cross-section, similar to the pooling in Houston and James (1996). That is, when we estimate the relation for the whole 1983-97 period, we actually use only the data of year 1983, 86, 90, 94, and 97. Likewise, when we split the whole sample into roughly equal subperiods, the "80s" sample contains the data of year 1983, 86, and 90, while the "90s" sample consists of the 1991, 94, and 97 cross-sections. This provides a comparatively simple way to weaken the serial correlation in regression variables. The downside is a loss of power; but that makes our significant results even more convincing.

4. The Sample and its Shifts around the Deregulation: Descriptive Statistics

Table 2 describes the financial structures in our sample in terms of simple averages over the entire period and for various subperiods. Most figures are self-explanatory, so that a brief discussion of some key features suffices. For convenience we also provide, in Figure 2, time-series plots for the leverage and bank-loan ratios. Unlike the tables (and the regression analysis of Section 5), these plots also include the 1977-83 period where, it will be recalled, industrial bonds were largely main-bank loans taken off the bank's balance sheet.

In Panel A of Table 2, the highest average market-to-book ratio is observed for 1983-89, the subperiod that contains the stock-market boom. Later on, as the recession lengthens and the extent of the banking crisis becomes manifest, the figure slides, ending at a rather down-beat 1.53 for 1994-97. The dummy variable "Public", whose average measures the proportion of the firms that had public debt outstanding, peaks at 0.55 for 1991-93, right after the pre-1990 deregulation. Afterwards the proportion drops somewhat, to 0.46, but even that figure remains way above the 0.37 level of the 80s. That is, the shift of debt away from bank borrowing was not just a short-term fad. For many of these numbers there are notable differences between keiretsu and non-keiretsu firms, as shown in Panel B and C. The former are marginally fewer than the latter (332 versus 371) but tend to be much larger. The annual

average of total book assets, Total Asset, is 263 versus 118 billion Japanese Yen for 1991-93. It can also be verified that keiretsu firms are more levered, have more public debt outstanding, and report lower coverage ratios—three ominous characteristics when entering a pronounced recession.

To study the evolution over time, the time-series plots are more convenient. Figure 2 shows the 1977-99 paths of equally-weighted average bank-loan ratios and leverage ratios for three sets of firms: the entire sample (Panel A), and the keiretsu and non-keiretsu subsets (Panel B). We report, in fact, two bank-loan ratios: loans (i.e. total bank loans) to debt, and short-term loans to debt. The evolution of long-term loan to debt can, of course, be inferred from the distance between the other two. We start our discussion with total leverage.

Recall that the deregulation of corporate finance in Japan started (modestly) in the mid 70s with the weakening of equity links between banks and industrial companies, and made a giant stride in 1983 when the unsecured-bond market was opened up to a wide class of companies. Not surprisingly, in that light, the leverage ratio of a typical Japanese firm dropped quite markedly, from 0.65 in 1977 to about 0.5 in the late 80s. This validates, in a larger sample, earlier evidence by Campbell and Hamao (1995). As of the late 80s onwards, leverage stabilizes but the composition of debt keeps changing in interesting ways. As shown in Panel A of Figure 2, already in 1977-82 long-term bank loans were being replaced by (some) bond issues and (mostly) short-term bank debt, but these initial changes remained modest. To the 1983 reforms, in contrast, borrowers reacted with outright alacrity: as Panel A of Figure 2 shows, the total loan ratio dropped substantially, from 0.9 in 1983 all the way to about 0.7 in the early 90s. The 1990 lifting of the remaining restrictions on bond placement—the event deemed to be a watershed by Hoshi, Kashyap and Scharfstein (1993) and Anderson and Makhija (1999)—met with far less of a response. Actually, in the nineties we observe a (partial) reversal towards bank loans when, in response to the stock-market collapse (December 1989) and the Basle rules, banks went for the better-quality borrowers.[13] Throughout the period, most of the variation in the total-loan ratio apparently stems from the short end (albeit with a lag of one or two years); that is, the 1983-1990-1997 debt-mix shifts are largely between bonds (unmonitored debt) and short-term loans (the class of debt providing maximal control to banks).

Many of the above shifts become more understandable when we study the keiretsu and non-keiretsu subsets separately. The plots in Panel B of Figure 2 display the time paths of average total loan ratios and average long-term loan ratios for each of these subsets, again

[13]The Bank for International Settlements (BIS) capital adequacy rules were introduced in 1988 as an international standard for banks around the world to follow. As an important part of the deregulation of its financial system, Japan implemented the rules in 1993, forcing Japanese banks to raise their capital ratio that used to stay much lower than the BIS standard. Many believe that the BIS rules were the major catalyst to the loan problems of Japanese banks (see, e.g. Marsh and Paul, 1997).

alongside their average leverage ratios. As we already saw from Table 2, keiretsu firms had systematically higher leverage and public-debt ratios. Either of these phenomena is readily explained by a pure size effect (with keiretsu firms being larger), or closer bank ties, or both. Over time, however, the leverage ratios of a typical keiretsu firm fell more rapidly: member corporations simply cut their overall borrowing to the (much more slowly falling) level for non-keiretsu companies. This differential unleveraging is probably at least partly related to differential debt-overhang problems. However, the keiretsu-companies' concomitant faster drop in the importance of bank loans may also indicate lower benefits from relationship banking (or, more pessimistically, increased rent extraction by battered keiretsu banks). Interestingly, indeed, there seems to be no convergence between both classes of firms *re* overall reliance on bank funding. Most of the post-1990 rise in aggregate bank-loan financing, lastly, seems to originate from non-keiretsu corporations. Thus, despite the keiretsus' glorious past, the flight for quality was mostly a flight to non-keiretsu companies.

Panel B of Figure 2 reveals another interesting difference. For keiretsu firms, the increased adoption of bond financing in 1983-90 goes together with an even faster shedding of long-term bank loans. That is, keiretsu main banks actually increased their short-term intra-group lending despite a lower overall demand for loans. We see no such effect for non-keiretsu firms. This evolution may have been a response, on behalf of banks, to the deregulation of Japan' financial system. Recall that, in the 80s, banks' direct powers of control (in terms of inside shareholdings) were being limited to at most five percent per firm by 1987. Thus, banks may have been become receptive to the higher flexibility and the increased frequency of borrower-performance reviews offered by short-term lending. After 1990, in contrast, it was among non-keiretsu firms that short-term debt gained importance. That, however, was another story: as non-keiretsu firms simultaneously increased their long-term borrowing too, what we see is mostly the result of banks' flight for quality.

5. Cross-sectional Analysis of the Debt-Mix Choice: Empirical results

In this section, we present the main empirical findings of the paper: the U-shaped relationship and its shifts over time and governance subsets (subsection 5.1). We also examine whether and how other factors than corporate growth play a role in the debt mix choice (subsection 5.2). Our results can explain the seemingly contradicting findings from the linear regressions adopted hitherto in the literature (subsection 5.3).

5.1. Is Debt Mix a U-shaped function of MtB?

In Table 3 we present the results for the basic regression without keiretsu dummy (Model I). We note that in the Total Period column, the slopes for both MtB and its square term are significant (p-values < 0.000). More precisely, the slope estimate for MtB is negative while

the estimated coefficient of MtB^2 is positive. Thus, the estimated relation between the weight of bank loans in total debt and MtB conforms to the illustration in Figure 1—a U-shaped curve bottoming out in the positive domain for MtB. Corporate interest in bank loans is estimated to be at its lowest, unconditionally, for a market-to-book of 3.7, well inside the range of MtB ratios present in the data.

In the remainder of the top part of Table 3 we verify the internal validity of this pooled-cross-section result by looking, first, at results from two roughly equal sub-periods, 83-90 and 91-97. We still find overwhelming evidence for a quadratic relation in each of the two periods. The turning point, where the slope of estimated relative demand for banking services as a function of MtB changes from negative to positive, is somewhat lower in the second half of the sample (market-to-book of 2.96, versus 3.69 in the first half). This shift of the turning point is normal when uncertainty rises, as argued in Section 3.2.

To isolate the stock-market peak and to better understand the Hoshi-Kashyap-Scharfstein and Anderson-Makhija results, we next single out the years 1990 and 1992, respectively, and re-estimate separately for (i) 1983-86-89, (ii) 1990, (iii) 1992, and (iv) 1994-97. In each of the pooled samples, 1983-86-89 and 1994-97 we still find a very clear quadratic. In the single-cross-section estimations, for 1990 and 1992, however, the negative coefficient for MtB is not unambiguously significant (p-value=0.096 in 1990) or only marginally so (p-value=0.064 in 1992). To some extent, this may be due to the smaller sample size. But at least part of the explanation must be the shift of the regressor distribution. Recall, from our discussion in Section 3.2, in the 1990 sample the (lagged) market-to-book ratios are at a historic high. The result is that, while in the 1983-89 regressions 90 percent of the data points are in the domain with a negative estimated slope, in the 1990 sample just over half of the data do so. In addition, MtB has a strongly right-skewed distribution. For example, from Table 1 the range between the means of deciles 1 and 5 (where most of the negative-sloped section is found) is about one-fourth the range between deciles 5 and 10 (where the positive-sloped section is situated). Thus, with fewer and more bunched-together observations, the negative-sloped end of the curve section is inevitably estimated with less precision. However, even in the 1990 sample the coefficient for MtB^2 remains significant, thus again rejecting the idea that demand for bank services would be unrelated, or only linearly related, to market-to-book. A last conclusion from this set of regressions is that the leftward shift of the turning point, as of 1990, is not reversed in 92 and 94-97: we still find it in each of these subsamples. This, as we argued in Section 3.2, is what one would expect in a severe recession.

In Panel A of Table 4 we use realized sales growth over the past five years instead of MtB. The results are very similar to, and if anything even better than, those from Table 3. In each and every sample (including, this time, the single-year ones) there now is a significant negative coefficient for growth and a significant positive coefficient for growth squared. It is not obvious whether this marginally better performance is due to MtB's non-linear

transformation of growth or the presence of other factors than growth. However, MtB still does appear to contain information not included in past sales growth and relevant for present purposes and *vice versa*. When we run the regressions with both of the growth proxies, as shown in Panel B of Table 4 where results for control variables are suppressed, each of them is generally significant.

As a last internal-validity check of the U-phenomenon we look at the keiretsu and non-keiretsu subsets separately, again across the entire sample and in each of the two or four sub-periods. Thus, we now turn to Model II by adding three regressors: K, K*MtB and K*MtB^2 where K is the dummy that indicates membership of the Big-Six keiretsu. The results are presented in Table 5. To save space, we again suppress the coefficients for the other variables, and we show the coefficients for the keiretsu members as differentials relative to the non-keiretsu sample. The estimates for the non-keiretsu subsets have exactly the same pattern as the all-firm coefficients: (i) for all samples bar the 1990 cross-section, there is a significantly negative linear component and a significantly positive squared component; (ii) for the 1990 cross-section, the slope of the linear part is still correct in sign, but no longer statistically unambiguous (because the sample as a whole is smaller, there are fewer observations on the negative-sloping section, and these have low variability). As for keiretsu dummies, none of them is significant in Table 5. The keiretsu results (not shown but available on request) are very similar to those from the other half of the firms. We have offered possible explanations in Section 3.2. Specifically, the existence of a U-shape even within the keiretsu subgroup of firms is consistent with the notions that (i) member firms retain a considerable degree of independence in their financing decisions, and (ii), as a result, banks have taken care to keep any rent-extraction behavior in line with the benefits from keiretsu membership.[14]

5.2. Results for the control variables

In view of the study by Anderson and Makhija (1999), one legitimate source of concern is that the positively sloped section of the U-shape may have been caused by pre-1990 regulation. Specifically, if public-debt-constrained firms tend to exhibit high growth, the spurious conclusion would have been that high growth increases one's preference for bank financing. Thus, our estimations always include a dummy CON (indicating whether or not the firm faces regulatory restrictions when tapping the bond market) as a main effect and as interactions with MtB and MtB. In Tables 3, CON is significant for the total period as well as

[14] Wu and Xu (2001) find that the valuation information of financial decisions by both keiretsu and non-keiretsu firms was different before but looks similar after the Japanese financial deregulation. They conclude that the deregulation has rendered the Japanese corporate financial policies in a more market-mediated balance regarding their benefits and costs.

the first half of the sample period (when the restrictions did apply), as are its interactions with MtB and MtB^2. For constrained firms, the linear slope becomes less negative, and the coefficient for the squared variable less positive; in short, the U-shape is less pronounced, as one would expect if the U-shape represents optimal behavior but some firms are restricted in their movements. When growth is measured as past average sales growth, as shown in Panel A of Table 4, the interactions with CON are insignificant but the main effect is positive. In short, also for constrained firms there is a U-shape, but it is shifted upward and/or less pronounced, as one would expect.

For the second period with MtB as growth proxy, as shown in Table 3, differences between formerly constrained firms and the other ones become blurred. This again seems exactly as what one would expect when the regulatory restrictions are lifted—until one looks at the separate results for 1992 and 1994-97. It appears that the blurring of the distinction, post 1990, is just due to a very confusing 1992: in 1994-97 the formerly constrained firms again behave very differently from other ones, and in the same direction as pre 1990. In the same vein, the results from Panel A of Table 4 show that the constrained firms kept borrowing unambiguously more from banks even after 1990 (and, this time, also clearly so in 1992). Even speaking algebraically rather than in terms of statistical significance, Panel A of Table 4 shows no evidence whatsoever that formerly restrained firms shunned bank loans after the liberalization, in line with the diagnosis by Anderson and Makhija (1999). Anderson and Makhija (1999) do not go beyond 1990 because the restrictions are lifted at that time and constrained firms cannot be meaningfully identified after 1990. While we do not dispute their logic,, our tests on post-90 data are nevertheless revealing: even in late 1990s, the variable CON does seem to capture some crucial corporate characteristic(s) over and above our control variables. Thus we conclude, like Anderson and Makhija, that the pre-1990 regulatory restrictions were not the sole reason why these constrained firms relied so much on bank loans.

Our results on the slope estimates for these other control variables are largely consistent with theory (see Section 3.2) and with those found by Hoshi, Kashyap and Scharfstein (1993) and Anderson and Makhija (1999). The slope estimate for Logsize, a proxy for firm size, is always significantly negative, regardless of specifications and sample periods. Because of their lower information and contracting costs in the public market, large firms take more unmonitored debt into their debt mix, a result similar to the evidence for U.S. firms (Houston and James, 1996, and Johnson, 1997). The slope estimates for Leverage and the coverage dummy ("Cov<3") are always significantly positive regardless of specifications and sample periods. That is, a higher likelihood of financial distress means more demand for loans from banks (who are more flexible if conditions turn ugly, have lower costs in acquiring and digesting information, and offer more privacy). The evidence on leverage and coverage is particularly consistent with Anderson and Makhija (1999). The slope estimate for the fixed-

assets ratio is significantly negative for the whole period regardless of specifications, as shown in Table 3 as well as Table 4. These results seem to be driven by the data for the 90s (p-value=0.04, against p-value=0.29 in the 80s). A similar picture emerges for the slope estimate for earnings volatility: this coefficient is significantly positive (as expected, for the same reason as coverage or leverage), but only clearly so in the second half of the period. The fact that in the recession years fixed assets and volatility seem to matter more, both statistically and economically, again indicates that banks became more choosy when the going got rough.

5.3. What would we have concluded from a linear regression?

As we have shown, the evidence of non-linearity is unambiguous. So if we now discuss results for a linear regression we do so purely to be able to verify the results by Anderson and Makhija (1999) and by Hoshi, Kashyap and Scharfstein (1993) on the early 1990s cross-sections, immediately after the liberalization. Both used linear regressions similar to our "Model III". The first paper found a significantly positive slope for all firms, the second one a negative one for keiretsu firms.

In a standard linear regression over our entire sample, as shown in Table 6, there is no demonstrable link (slope for MtB=0.009, p=0.26). If sufficiently tenacious to run the subperiod regressions (also in Table 6), one would have noted a positive slope in the first half of the period, which upon closer inspection is largely due to 1990. Interestingly, the positive slope persists into 1992 but turns significantly negative afterwards. When pooled for 1991-97, the latter two positive- and negative-sloped samples produce the insignificant coefficient for the second subperiod in Table 6. In short, whereas the evidence for the quadratic model is consistent in all subsamples (apart from the easily explained half-ambiguity for one of the growth proxies in 1990), the linear-regression results are all over the place.

In light of our evidence on the non-linearity, the absence of significance here in most samples is like a textbook example of positive and negative sections interfering with each other in a misspecified regression. The 1990 positive slope, in contrast, is the result of the fact that, at the time of the stock-market peak (and unusually so), most firms were on the positively sloping part of the U-function rather than the other way around.[15] Thus, representing the peak of the stock market, the sample picked up by Anderson and Makhija (1999) turns out to be rather special. Hoshi, Kashyap and Scharfstein (1993) find a negative slope for keiretsu firms around the similar time. Keiretsu firms tended to have lower market-to-books; therefore, their sample was taken mostly from the negative-sloped segment of the U-relation.

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[15]By 1992, stock prices has fallen substantially, but that year was again special in the sense that its turning-point—the market-to-book ratio where demand for bank loans is at its minimum—reached an all-time low, too.

6. Conclusion

In this paper, we propose a non-linear relation regarding corporate choice between monitored and unmonitored debt and firm's expected growth, MtB (the market-to-book ratio). Using data on Japanese firms, we do find that in the lower ranges of growth, there is a significantly negative relation between the debt mix choice (measured by the ratio of bank loans to total debt) and growth, while there is a significantly positive relation in the upper-third range of MtB. Thus, towards *both* ends of the growth spectrum, firms use more monitored debt in their debt mix, but for distinct reasons. Firms with poor prospects (high risk relative to growth) rely on banks to monitor and control agency problems such as overinvestment. In contrast, firms with rather exceptional growth prospects, inherently fraught with severe information asymmetries and high credit risk, can better communicate with banks than with the public market; thus, they rely on banks so as to avoid the formidable information and contracting costs of raising public debt. In the middle spectrum of MtB, lastly, formerly unglamourous stocks have (re)acquired better prospects and improved reputations, or once high-growth stocks have matured. To these respectable and reliable firms, intermediation by banks provides few benefits, and the costs of rent-extraction by banks seem to exceed the information and agency costs of pubic debt.

From our empirical evidence we conclude that there is definitely a U-shaped relation between the bank-loan and market-to-book ratios. The turning point, where faster growers start getting more interested again in bank relations, is moving, to some extent, with the general market-to-book distribution, except for 1990. On average—but not in 1990—most firms are on the negative-sloped segment. That is, for the majority of firms, improved market-to-book ratios go hand in hand with more arm's-length borrowing. Thus, our findings lend credibility to the combined Diamond (1991)/Sharpe (1990)/Rajan (1992) model: the very act of borrowing from banks reduces the relative benefits from subsequent private funding (Diamond), and this, in light of the hold-up costs from bank borrowings (Sharpe, Rajan), pushes the firms towards the bond market.

By the same token, our evidence as a whole does not contradict the strand of literature that argues for the monitoring and control benefits (Fama, 1985, Diamond, 1984, Berlin and Loeys, 1988, and others). Rather, we merely contend that, for moderate-to-high MtB firms, such benefits seem to overwhelm the costs of bank debt. Or, stated positively, we find that firms with unusually high MtB do take more bank loans in their debt mix, due to their higher information and contracting costs of raising public debt, as do firms that have too little glamour rather than too much.

The U-shaped model for the relation between the debt mix and MtB can accommodate many existing banking and finance theories. As our evidence shows, it holds in the early 80s, when Japanese regulatory restrictions on bond assurance were still binding for many firms, as

well as in the mid and late 90s, when as far as regulation was concerned all firms were free to chose their debt mix. It holds for both keiretsu and non-keiretsu firms; indeed, there is no statistically clear difference between the two groups. One interpretation is that, even if main banks may have exhibited hold-up behavior at all in their heydays, they lost that power when Japan's deregulation (1983, 1990) produced a more market-mediated corporate financial system. However, the absence of a keiretsu effect even pre 1983 sugests that main banks may always have kept rent extraction in line with benefits from keiretsu membership.

In view of the pervasiveness of our evidence, the empirical results obtained by Anderson and Makhija (1999) and Hoshi, Kashyap and Scharfstein (1993) appear less contradictory than they seem at first sight. These results seem to result from applying a linear model to a U-shaped relation, and focusing periods where the statistical weight of the positive leg of the U-shape changed drastically. In sum, our proposed non-linear model also reduces some of the confusion and apparent contradiction in the empirical literature on Japanese corporate debt mix choice.

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Table 1: The distribution (intra-decile averages) of the market-to-book ratio

In each year, annual market-to-book ratios, MtB, of individual Japanese firms at the end of previous fiscal year t-1 are sorted into decile groups and averaged within each subgroup. D1 (D10) stands for the average of MtB's in the lowest (highest) tenth of the ordered data. This table shows the decile averages for 1983-89, 1990, and 1991-97, respectively. The 1983-89 and 1991-97 figures are averages of the year-by-year figures. The boldface figures in each row are the ones closest to 1.53, the D1 value in 1990.

	Intra-decile Average of Market-to-book Ratio (MtB)									
Period	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
1983-89	1.14	1.33	1.46	**1.58**	1.72	1.87	2.05	2.31	2.76	4.29
1990	**1.53**	1.90	2.12	2.33	2.54	2.80	3.09	3.47	4.20	6.53
1991-97	1.05	1.21	1.31	1.40	**1.50**	1.61	1.74	1.90	2.15	2.92

Table 2: Sample description for Japanese firms from late 70s to late 90s

This table shows annual averages of financial statement variables for all Japanese business firms (Panel A), keiretsu firms (Panel B), and non-keiretsu firms (Panel C), during various periods. Keiretsu firms are members that belong to the Big Six financial groups and non-keiretsu firms are weakly affiliated or unaffiliated firms. Data are from the PACAP database for Japan. Firms, excluding sectors of financials (Japanese Industrial Codes 0501-0513), utilities (0801), and communications (0705), have non-missing data reported in this table for the whole sample period from 1978 to 1997. Total Asset in billions of Japanese Yen is the book value of bank loan (PACAP data items: JAF33+JAF34+JAF48) and public debt (JAF35+JAF49+JAF50+JAF51) plus book equity (BAL21) at the end of the previous fiscal year (t-1). Leverage is the sum of bank loan and public debt, Debt, divided by total assets. Value-to-cost ratio (MtB), a proxy for Tobin's Q, is the market value of total assets, which equals Debt plus market value of outstanding common stocks (MKT3 times MKT5), divided by total assets at the end of fiscal year t-1. Bank Loan ratio, Bank Loan/Debt, is bank loan divided by the sum of bank loan and public debt, Debt, at the end of fiscal year t. Short-term loan, St. Loan, is the book value of short-term bank loan (JAF33+JAF34). Long-term loan, Lt. Loan, is the book value of long-term bank loan (JAF48). The other two bank loan ratios, St. Loan/Debt and Lt. Loan/Debt, are also reported at the end of fiscal year t. Coverage is measured as operating income adjusted for depreciation charges (INC5+JAF74) divided by total interest charges (JAF67) at the end of fiscal year t-1. Fixed Assets ratio is the net fixed assets (BAL7) divided by total assets at the end of year t-1. Earnings Volatility is the standard deviation of the percentage changes in operating incomes in the past five fiscal years [(INC5-INC5(-1)/INC5(-1)]. Public is a dummy variable, equal to one if a firm has any public debt outstanding at the end of year t-1.

	Panel A: All Firms				Panel B: Keiretsu Firms				Panel C: Non-keiretsu			
	'78-82	'83-90	'91-93	'94-97	'78-82	'83-90	'91-93	'94-97	'78-82	'83-90	'91-93	'94-97
No. of Firms	703	703	703	703	332	332	332	332	371	371	371	371
Total Asset	77.80	118.8	186.1	186.5	111.9	168.4	262.7	261.0	47.20	74.50	117.6	119.8
Leverage	0.61	0.55	0.51	0.51	0.64	0.57	0.53	0.52	0.57	0.53	0.50	0.50
Value/cost ratio	1.46	2.17	1.87	1.53	1.49	2.23	1.89	1.59	1.44	2.12	1.86	1.48
Bank Loan/Debt	0.93	0.81	0.70	0.74	0.92	0.78	0.66	0.69	0.95	0.84	0.74	0.79
St. Loan/Debt	0.63	0.61	0.49	0.54	0.59	0.57	0.45	0.49	0.67	0.64	0.53	0.58
Lt. Loan/Debt	0.30	0.20	0.21	0.20	0.33	0.21	0.21	0.20	0.27	0.20	0.21	0.21
Coverage	3.45	4.95	5.11	8.67	2.82	4.49	4.39	7.69	4.01	5.35	5.76	9.54
Fixed asset ratio	0.38	0.37	0.38	0.39	0.39	0.39	0.39	0.40	0.36	0.36	0.37	0.39
Earnings σ	N.A.	2.09	1.59	1.59	N.A.	2.20	1.50	1.34	N.A.	1.99	1.66	1.82
Public	0.30	0.37	0.55	0.46	0.37	0.44	0.63	0.55	0.24	0.30	0.47	0.38

Table 3: Regression results for model I

This table presents the regression estimation for the cross-sectional relation of debt mix choice to firm's value-to-cost ratio (MtB) for Japanese firms. We use a Tobit model with, as the dependent variable (restricted within [0, 1]) the total bank loan ratio at the end of fiscal year t. Cross-sectional annual data on firms are pooled across skipping years. The whole sample include annual data for 1983, 86, 90, 94, and 97, which are then split in roughly equal subsamples—the 80s (1983, 86, and 90) and the 90s (1991, 94, and 97. Corresponding explanatory variables are lagged, observed at the end of previous fiscal year t-1, and include year and industry dummies. Logsize is the log of total book assets. Leverage is the sum of bank loan and public debt divided by the total assets. MtB is value-to-cost ratio, a proxy for Tobin's q, or firm's growth opportunities. MtB^2 is the square of the level. Cov<3 is a dummy variable, which equals one if the coverage ratio is less than three and zero otherwise. Fixed Asset is the net fixed assets ratio. Volatility is earnings volatility. See notes in Table 2 for more details. P-values are provided in italic below the corresponding estimates. Estimates for year and industry dummies are not reported for conciseness. "Turning point" is the value of MtB where the relationship with the bank-debt ratio turns from negative to positive.

	83-97	83-90	91-97	83-89	90	92	94-97
Intercept	2.294	2.254	2.074	2.243	1.902	1.850	2.291
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
MtB	-0.157	-0.133	-0.213	-0.144	-0.073	-0.155	-0.450
	0.000	*0.000*	*0.000*	*0.000*	*0.096*	*0.064*	*0.000*
MtB^2	0.021	0.018	0.036	0.018	0.012	0.034	0.094
	0.000	*0.000*	*0.000*	*0.000*	*0.021*	*0.047*	*0.000*
CON	-0.006	-0.021	0.076	-0.127	0.279	0.361	-0.414
	0.920	*0.767*	*0.466*	*0.069*	*0.214*	*0.180*	*0.052*
CON*MtB	0.129	0.130	0.100	0.242	-0.049	-0.179	0.673
	0.009	*0.009*	*0.243*	*0.000*	*0.695*	*0.485*	*0.003*
CON*MtB^2	-0.015	-0.015	-0.018	-0.027	0.007	0.049	-0.169
	0.050	*0.038*	*0.239*	*0.000*	*0.666*	*0.382*	*0.002*
Logsize	-0.123	-0.127	-0.111	-0.124	-0.117	-0.100	-0.111
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Leverage	0.257	0.334	0.186	0.369	0.245	0.159	0.171
	0.000	*0.000*	*0.000*	*0.000*	*0.005*	*0.078*	*0.007*
Cov<3	0.146	0.127	0.151	0.108	0.200	0.149	0.145
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Fixed Asset	-0.062	-0.040	-0.087	-0.067	0.020	-0.110	-0.079
	0.046	*0.285*	*0.037*	*0.076*	*0.771*	*0.103*	*0.131*
Volatility	0.001	0.000	0.004	0.000	0.003	0.000	0.014
	0.122	*0.344*	*0.006*	*0.327*	*0.078*	*0.832*	*0.001*
Turning point (decile)	3.738	3.694 (D9)	2.958 (D6)	4.001 (D10)	3.042 (D6)	2.279 (D9)	2.393 (D9)

Table 4: Measuring growth by past sales growth instead of MtB in Model I

This table reports results of robustness check on the growth proxy using the market-to-book ratio, MtB. In Panel A, we replace MtB by average annual sales growth over the past five years, Sales-growth (or simply Growth), in the regressions; otherwise the regression is the same as in Table 3. In Panel B, we include both MtB and Sales-growth in the regressions. To save space, the coefficients of the other regressors are suppressed in Panel B. See notes in Table 3 for more details.

Panel A: Replacing MtB with past Sales-growth

	83-97	83-90	91-97	83-89	90	92	94-97
Intercept	2.147	2.155	1.810	2.163	1.890	1.760	1.809
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Growth	-1.200	-1.150	-1.521	-1.321	-1.810	-2.141	-1.119
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.002*	*0.001*
$Growth^2$	5.256	4.987	6.337	5.221	9.440	7.454	7.696
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.019*	*0.008*
CON	0.161	0.159	0.186	0.206	0.170	0.293	0.186
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
CON*Growth	0.315	0.181	0.318	0.176	0.981	-1.598	-0.061
	0.414	*0.733*	*0.524*	*0.742*	*0.274*	*0.305*	*0.926*
$CON*Growth^2$	-2.329	-2.156	-1.989	-2.659	-3.019	6.622	-3.512
	0.264	*0.359*	*0.491*	*0.274*	*0.617*	*0.356*	*0.493*
Logsize	-0.122	-0.128	-0.107	-0.128	-0.121	-0.094	-0.107
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Leverage	0.292	0.369	0.212	0.412	0.252	0.160	0.186
	0.000	*0.000*	*0.000*	*0.000*	*0.003*	*0.075*	*0.003*
Cov<3	0.137	0.123	0.132	0.105	0.178	0.131	0.142
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Fixed Asset	-0.073	-0.047	-0.108	-0.079	0.010	-0.139	-0.099
	0.021	*0.223*	*0.011*	*0.041*	*0.885*	*0.044*	*0.063*
Volatility	0.001	0.000	0.004	0.000	0.003	0.000	0.012
	0.170	*0.393*	*0.029*	*0.482*	*0.101*	*0.860*	*0.003*

Panel B: Including Both MtB and past Sales-growth

	83-97	83-90	91-97	83-89	90	92	94-97
Intercept	2.392	2.367	2.157	2.400	2.057	2.090	2.298
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
MtB	-0.105	-0.095	-0.135	-0.080	-0.053	-0.134	-0.275
	0.000	*0.000*	*0.001*	*0.002*	*0.192*	*0.102*	*0.002*
MtB^2	0.016	0.015	0.026	0.012	0.011	0.036	0.059
	0.000	*0.000*	*0.000*	*0.001*	*0.022*	*0.034*	*0.004*
Growth	-1.101	-1.247	-1.302	-1.502	-1.775	-2.285	-0.901
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.002*
$Growth^2$	4.654	4.960	5.207	5.401	8.852	8.081	5.617
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.003*	*0.020*

Table 5: Results for Model II (Keiretsu-membership interactions for MtB and MtB^2)

This table presents the regression estimation for the cross-sectional relation of debt mix choice to firm's value-to-cost ratio (MtB) for Japanese firms. We use a Tobit model with, as the dependent variable (restricted within [0, 1]) the total bank loan ratio at the end of fiscal year t. Cross-sectional annual data on firms are pooled across skipping years. The whole sample include annual data for 1983, 86, 90, 94, and 97, which are then split in roughly equal subsamples—the 80s (1983, 86, and 90) and the 90s (1991, 94, and 97). Corresponding explanatory variables are lagged, observed at the end of previous fiscal year t-1, and include year and industry dummies. Logsize is the log of total book assets. Leverage is the sum of bank loan and public debt divided by the total assets. MtB is value-to-cost ratio, a proxy for Tobin's q, or firm's MtB opportunities. MtB^2 is the square of the level. K is a keiretsu dummy variable, which equals one if the firm is a keiretsu member and zero otherwise. Cov<3 is a dummy variable, which equals one if the coverage ratio is less than 3 and zero otherwise. Fixed Asset is the net fixed assets ratio. Volatility is earnings volatility. See notes in Table 2 for more details. P-values are provided in italic below the corresponding estimates. Estimates for year and industry dummies are not reported for conciseness.

	83-97	83-90	91-97	83-89	90	92	94-97
Intercept	2.328	2.292	2.122	2.314	1.923	2.012	2.217
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
MtB	-0.092	-0.073	-0.148	-0.075	-0.019	-0.146	-0.213
	0.001	*0.011*	*0.009*	*0.016*	*0.693*	*0.126*	*0.060*
MtB^2	0.014	0.012	0.027	0.011	0.007	0.035	0.044
	0.000	*0.001*	*0.008*	*0.010*	*0.195*	*0.053*	*0.101*
K	0.031	0.114	-0.091	0.050	0.131	-0.029	0.031
	0.562	*0.069*	*0.292*	*0.415*	*0.402*	*0.886*	*0.848*
K*MtB	-0.045	-0.077	0.030	-0.029	-0.084	-0.030	-0.104
	0.290	*0.091*	*0.690*	*0.502*	*0.347*	*0.878*	*0.543*
$K*MtB^2$	0.007	0.010	-0.002	0.004	0.010	0.016	0.026
	0.333	*0.176*	*0.863*	*0.581*	*0.380*	*0.713*	*0.526*

Table 6: Results for Model III (purely linear model, i.e. MtB^2 omitted)

This table presents the regression estimation for the cross-sectional relation of debt mix choice to firm's value-to-cost ratio (MtB) for Japanese firms. We use a Tobit model with, as the dependent variable (restricted within [0, 1]) the total bank loan ratio at the end of fiscal year t. Cross-sectional annual data on firms are pooled across skipping years. The whole sample include annual data for 1983, 86, 90, 94, and 97, which are then split in roughly equal subsamples—the 80s (1983, 86, and 90) and the 90s (1991, 94, and 97). Corresponding explanatory variables are lagged, observed at the end of previous fiscal year t-1, and include year and industry dummies. Logsize is the log of total book assets. Leverage is the sum of bank loan and public debt divided by the total assets. MtB is value-to-cost ratio, a proxy for Tobin's q, or firm's growth opportunities. Cov<3 is a dummy variable, which equals one if the coverage ratio is less than three and zero otherwise. Fixed Asset is the net fixed assets ratio. Volatility is earnings volatility. See notes in Table 2 for more details. P-values are provided in italic below the corresponding estimates. Estimates for year and industry dummies are not reported for conciseness.

	total	two suberiods		Isolating the years 1990 and 1992			
	1983-98	1983-90	1991-97	1983-89	1990	1992	1994-97
Intercept	2.219	2.166	1.961	2.219	1.771	1.821	2.112
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
MtB	0.009	0.015	0.006	0.000	0.037	0.039	-0.043
	0.263	*0.056*	*0.625*	*0.985*	*0.001*	*0.075*	*0.067*
Logsize	-0.140	-0.141	-0.132	-0.145	-0.131	-0.122	-0.132
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Leverage	0.404	0.473	0.354	0.517	0.438	0.337	0.308
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Cov<3	0.174	0.160	0.175	0.155	0.234	0.177	0.168
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Fixed Asset	-0.057	-0.031	-0.085	-0.054	0.036	-0.094	-0.092
	0.070	*0.419*	*0.045*	*0.161*	*0.604*	*0.164*	*0.085*
Volatility	0.001	0.000	0.005	0.000	0.004	0.001	0.013
	0.079	*0.253*	*0.004*	*0.333*	*0.025*	*0.627*	*0.001*
Obs.	3515	2109	2109	2109	703	703	1406

Figure 1: Illustration of A Non-linear Relation between Debt Mix Choice and Growth

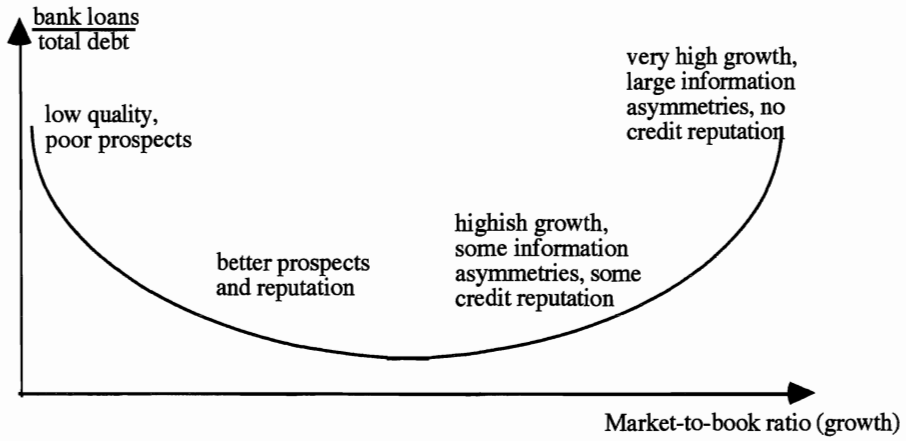
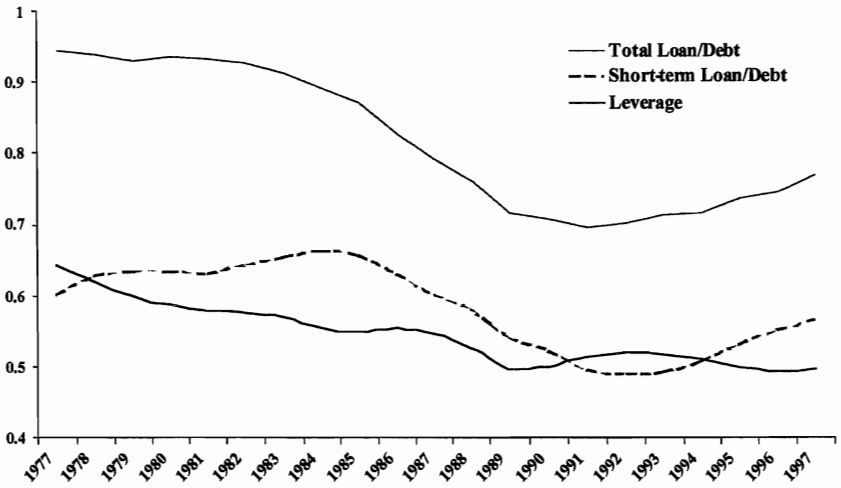


Figure 2: Bank Loan Ratios and Leverage of Japanese Corporations for 1977-97

Panel A: Japanese Firms Excluding Financials, Utilities, and Telecommunications



Panel B: Loan Ratios and Leverage for Keiretsu (K) and Non-keiretsu (NK) Sub-samples